DOCUMENT RESUME

ED 113 699 95 CS 002 203

AUTHOR Venezky, Richard L.
TITLE The Prereading Skills of Israeli Kindergartners. Technical Report No. 332.
INSTITUTION Wisconsin Univ., Madison. Research and Development Center for Cognitive Learning.
SPONS AGENCY National Inst. of Education (DHEW), Washington, D.C.
REPORT NO WRDCCL-TR-332
PUB DATE 75
CONTRACT NE-C-00-3-0065
NOTE 28p.

EDRS PRICE MF-$0.76 HC-$1.95 Plus Postage
DESCRIPTORS Beginning Reading; *Cross Cultural Studies; Cultural Differences; Kindergarten Children; *Language Development; Language Skills; Prereading Experience; Primary Education; Reading Research; *Reading Skills; *Reading Tests; *Test Construction
IDENTIFIERS *Israel

ABSTRACT

Tests for prereading skills of Israeli kindergarten children were developed and tested on a wide range of socioeconomic levels. Based on studies in the United States and Israel, tests were developed for letter matching, rhyming, sound matching, and letter recognition. Results from 178 kindergarten children led to a division of the letter matching test into two separate tests, one for testing attention to letter order and one for testing attention to word detail. A second set of tests was then developed, based on the most reliable items from the first set of tests. These tests included rhyming, sound matching, letter order, and word detail. Data on the tests from 94 subjects in four lower-middle socioeconomic status (SES) kindergartens showed reliable results; however, a few low reliability items were scheduled for replacement in the next test revision. Finally, a test was developed for assessing knowledge of propositions at the kindergarten level and was administered with children from four levels. Differences in test scores were found between the three highest groups and the lowest group, but problems were also revealed in the test itself. (Author/RB)

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Technical Report No. 332

THE PREREADING SKILLS OF ISRAELI KINDERGARTNERS

by

Richard L. Venezky

Report from the Project on
Conditions of School Learning and Instructional Strategies

Wisconsin Research and Development
Center for Cognitive Learning
The University of Wisconsin
Madison, Wisconsin

June 1975

CS 002 203

Published by the Wisconsin Research and Development Center for Cognitive Learning, supported in part as a research and development center by funds from the National Institute of Education, Department of Health, Education, and Welfare. The opinions expressed herein do not necessarily reflect the position or policy of the National Institute of Education and no official endorsement by that agency should be inferred.

Center Contract No. NE-C-00-3-0065

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The Wisconsin R&D Center is supported with funds from the National Institute of Education; the Bureau of Education for the Handicapped, U.S. Office of Education; and the University of Wisconsin.

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FOREWORD

This report summarizes a two-year study of prereading skills in Israeli kindergartners, using similar studies on United States children for comparison. The first goal of this study was to determine which of the prereading skills which were identified in the United States studies were also valid for Israeli children; the second goal was to develop a basis for instructional programs on prereading skills in Israel. This report incorporates and expands upon material contained in Progress Report No. 1 to the Spencer Foundation (Venezky, 1973) and continues earlier studies done by Venezky, Shiloah, and Calfee (1972). The work in Israel was carried out in the first year by Yael Shiloah and in the second year by Roberta Craemer and Shlomit Kaufman. Professor Michael Chen of the School of Education, Tel Aviv University, supervised the Israeli studies. Arieh Cohn and Michael Green assisted with data analysis at the University of Wisconsin. The cooperation of the Israeli Ministry of Education and especially the late Nitza Naphtali who was until recently Director of Kindergartens is especially acknowledged. Support for this work, in addition to that from the Spencer Foundation, was received from Tel Aviv University and from the Wisconsin Research and Development Center for Cognitive Learning.

ABSTRACT

Tests for prereading skills of Israeli kindergartners were developed and tested on a wide range of socioeconomic levels. The major goal of this work is to compare deficit patterns and learning rates in prereading skills between the United States and Israel in an attempt to determine which of certain problems in initial reading in the United States are unique to the English language and its orthography and to American cultural and educational patterns, and which extend at least to a second and somewhat dissimilar country.

Based upon studies in the United States and Israel, tests were developed for letter matching, rhyming, sound matching, and letter recognition. Results from 178 kindergartners led to a division of the letter matching test into two separate tests, one for testing attention to letter order and one for testing attention to word detail. Letter recognition scores were quite low, compared to United States data, and the test was therefore dropped.

A second set of tests was then developed, based upon the most reliable items from the first set of tests. These tests included rhyming, sound matching, letter order, and word detail. Data on the tests from 94 Ss in four lower-middle SES kindergartens showed reliable results; however, a few low reliability items were scheduled for replacement in the next test revision.

Finally, a test was developed for assessing knowledge of prepositions at the kindergarten level and administered with children from four SES levels. Differences in test scores were found between the three highest groups and the lowest group, but problems were also revealed in the test itself.

I

THE COMPARATIVE BASE

A strategy for isolating and analyzing prereading and early reading skills was developed at the Wisconsin Research and Development Center beginning in 1966 and applied over the last eight years to the study of prereading skills (Calfee, Chapman, & Venezky, 1972; Calfee, 1974; Venezky, 1974). Central to this strategy is the assumption that reading is a complex skill which can be decomposed into separately assessable subskills. Whether or not the subskills form a skill hierarchy in the strict sense is not essential; it is necessary only that component skills be identified through both logical and experimental means.

Through studies done at the University of Wisconsin, Stanford, and elsewhere, a variety of visual and auditory skills have been studied and their relationships to reading ability at the end of first grade have been determined. The most important of these skills are the following:

1. Visual matching of letters and words. This is the ability to compare two letters or letter strings and determine whether or not they are the same. It is typically measured with either a same-different choice; or a multiple choice, matching against a sample paradigm. Three subskills are identifiable for this skill:

   a. Attention to letter orientation (detecting that b is different from d and u from n).

   b. Attention to letter order (detecting that no is different from on).

   c. Attention to essential details (detecting that than is different from then).

2. Sound matching. The ability to compare two words on the basis of a component sound is essential for learning to read; yet the abstractness of the task makes it especially difficult for many kindergartners. Rhyming also requires sound matching ability, only with a final syllable rather than a single sound, and is also difficult at the kindergarten level, especially for children from the lowest SES levels.

3. Sound blending. Sound blending requires that separate sounds or sound sequences be used to produce words. Like sound matching, sound blending is an abstract task for most children. It requires memory for meaningless sounds, plus an understanding of how the sounds are to be united to form meaningful words.

Various other skills including vocabulary, immediate memory span, and letter naming correlate well with later reading success, but vocabulary and memory span are too general to be considered for prereading attention, and letter naming bears no logical relationship to reading or learning to read.

The above skills have been isolated through logical analysis and through a variety of experimental techniques, all of which depend upon correlations for their validity. More conclusive techniques for establishing the importance of these skills in the acquisition of literacy are only now being considered.

II

SUMMARY OF THE ISRAELI STUDIES

BASIC SKILLS TEST

The major goal of this work is to compare deficit patterns and learning rates in prereading skills between the United States and Israel in an attempt to determine which of certain problems in initial reading in the United States are unique to the English language and its orthography and to American cultural and educational patterns, and which extend at least to a second and somewhat dissimilar country. Israel was selected for comparison both for its similarities and its differences with the USA. In both countries most children enter kindergarten at the age of five, but do not begin formal reading instruction until a year later. In both countries there are major differences between socioeconomic strata, with the children from the lower strata making the least academic progress. Both Hebrew and English have alphabetic writing systems; however, Hebrew differs radically from English in reading direction, orthographic symbol types, and predictability of sound from spelling. In addition, Hebrew dialects are less sharply marked than American English dialects.

The prereading skills which are being investigated are selected primarily from similar work being done in the USA (Calfee et al., 1972; Chapman, 1971; Venezky et al., 1972), but are also determined by the results of this study and related studies in Israel. If there is a single hypothesis to this work, it is that patterns of prereading skill deficits will not differ markedly across cultures. To date, this hypothesis has been supported, except in the case of letter naming, which is not exactly a basic prereading skill in the same sense that sound matching and letter string matching are, but is more like an information set.

The Israeli studies were based initially upon the studies conducted in the United States; they attempted to compare skill deficits across the two cultures. To do this, tests for a variety of prereading skills were developed for Hebrew-speaking children and tested on the full range of Israeli SES levels. Through successive refinement stages, prereading skills tests were developed and the skills they tapped related to reading success at the end of first grade. Finally, from among the skills which were identified as significant in these studies, those which were most applicable to a kindergarten-level prereading skills program were selected, and the tests for them further refined. These skills included attending to letter order, matching sounds in spoken words, attending to word detail, and rhyming. Reports on two stages in the development of these tests and comparisons of the results to USA data are identified as Studies 1 and 2.

ANALYSIS OF LANGUAGE FACTORS

Two language factors were studied in this project: vocabulary and knowledge of prepositions. In the initial studies of basic prereading skills (Shiloah, 1973) a picture vocabulary test for Hebrew nouns and verbs was developed and tested on 80 first-grade children at the beginning of the school year. Using end of the year reading scores as a dependent measure, a multiple correlation was run with picture vocabulary and five other skills as independent measures. Picture vocabulary failed to make a significant contribution to the correlation obtained in a forced order analysis ($r = .72$; $p < .05$) and was dropped from further use (Shiloah, 1973).

Another study, reported here as Study 3, attempted to compare knowledge of prepositions by USA and Israeli children, and in particular to determine whether such knowledge varied with SES level in Israel as it does in the USA. A test consisting of 16 multiple choice items was developed and tested on 24 kindergartners. Although SES showed a significant effect in a one-way analysis of variance ($F[3/20] = 7.45$, $p < .05$), a variety of problems in the test itself were found which might explain the results, especially for the lowest SES group. (A post hoc Sheffé test showed significant differences only between the low group and each of the other three groups.) Furthermore, the scores for the top three groups were sufficiently high to indicate that most kindergarten children have an adequate knowledge of the prepositions tested. For this reason, the testing of prepositions was not pursued.

III

STUDY 1

THE DEVELOPMENT OF TESTS FOR THE PREREADING SKILLS OF ISRAELI KINDERGARTNERS

The initial development of tests for a variety of prereading skills of Israeli kindergartners was described in a previous study (Venezky et al., 1972). The present report covers an extension of this study and is concerned with tests for rhyming, letter matching, sound matching, and alphabet recognition.

The work reported here is concerned both with the improvement of testing instruments and with the comparison of test results between the USA and Israel.

METHOD

Subjects

One hundred and eighty kindergarten children from 12 different kindergartens, selected on the basis of socioeconomic status and sex, were included in the initial testing sample. Due to illness, two subjects were dropped, leaving the subject distribution shown in Table 1. Socioeconomic status was assigned on a class basis since only the most homogeneous classes were selected. Socioeconomic status computed for each group on the basis of individuals differs negligibly from the class-assigned status.

Procedure

All Ss were tested individually in the spring of 1972 approximately one month before the end of the school year. In 10 of the 12 kindergartens, testing was divided between experimenters and teachers. In the remaining two classrooms, only the experimenters tested (see Table 1).

Stimuli

Letter matching. The letter matching test consisted of 20 items preceded by four practice items. Each test item consisted of a standard which was circled and three alternatives which occurred on the same line to the left of the standard. Each item appeared on a separate card in printed form. The first ten items involved nonsense Hebrew words; the words in the first five of these ten items were composed of two letters, while those in the last five items were of three letters. The last ten items included meaningful words which consisted of four or five letters. No vowel points were included.

TABLE 1

DISTRIBUTION OF SUBJECTS BY SES, EXPERIMENTER, CLASS, AND SEX

SES	High			High-Middle			Lower-Middle			Lower			
Class	A	B	C	D	E	F	G	H	I	L	M	N	
Teacher Tested													
M	3	3	0	3	0	3	3	3	2	3	3	3	
F	3	3	0	3	0	3	3	3	3	3	2	3	
Total Teacher Tested	6	6	0	6	0	6	6	6	5	6	5	6	58
Experimenter Tested													
M	5	5	5	5	5	5	5	5	5	5	5	5	
F	5	5	5	5	5	5	5	5	5	5	5	5	
Total Experimenter Tested	10	10	10	10	10	10	10	10	10	10	10	10	120
Grand Total													178

Children were told to find the alternative which was exactly like the standard. (E circled with her finger the standard, then the alternatives, and again the standard, while asking S to point to one of the alternatives which was exactly like the standard.) Each item was scored according to the position of the alternative (1, 2, or 3, or 0 when no answer was given).

Rhyming. The rhyming test consisted of 16 items preceded by four practice items. Each item appeared on a separate card on which was a picture of the sample on the top line and three pictures, the alternates, on a line under the sample. The child was shown one test item at a time and was asked to repeat after E the name of each picture. He was then asked to find the alternate which ended the same way the sample did and to name the sample and that alternate. Each item was scored according to the position of the alternate (1, 2, or 3, or 0 when no answer was given).

Sound matching. The sound matching test aimed at testing the ability to detect a particular speech sound within a meaningful word. The test consisted of three parts, each consisting of two or three practice items followed by six test items. The items in each part tested the same sound. The sounds were the consonants /s/ and /g/ and the vowel /a/. Each item appeared on a separate card upon which were mounted three pictures on one line.

S was first presented with an isolated sound specific to a certain part of the test. He was then shown one item at a time and told that only one of the three words in each item included the specific sound. After E named the pictures, S was asked to point to the picture whose name had the specific sound. Each item was scored according to the position of the alternative (1, 2, or 3, or 0 when no answer was given).

Letter recognition. In the letter recognition test the child was shown 22 printed Hebrew letters (not including the five final letters) in random order, one at a time. He was asked to give the name of each. Responses were recorded as correct, incorrect, or no response.

RESULTS

The means, standard deviations, score ranges, and test reliabilities for the entire sample are summarized in Table 2. Correlations among the tests are given in Table 3. Separate 2 x 2 x 4 unequal-n analyses of variance--sex x tester x SES--were run, using each test score as a dependent measure. The results showed a significant main effect only for SES: $F(3/162) = 22.93$, $p < .001$ (rhyming); $F(3/162) = 13.56$, $p < .0001$ (sound matching); $F(3/162) = 12.92$, $p < .001$ (letter matching); and $F(3/162) = 4.72$, $p < .0035$ (alphabet naming). No interactions were significant at a .01 level.

From the part-whole correlations in the item analyses, the weakest items in each test were dropped so that letter recognition had 10 items and the other three tests had 12 items each. Scores for the reduced data sets by SES level and sex are shown in Table 4. Separate 2 x 4 analyses of variance

TABLE 2

TEST RESULTS--ORIGINAL DATA

Test	No. Items	$\bar{X}$	S.D.	Range	Hoyt Reliability
Letter Matching	20	14.24	4.27	4-20	.83
Rhyming	16	12.71	3.90	0-16	.89
Sound Matching	18	12.56	3.62	4-18	.77
Letter Recognition	22	6.24	6.61	0-22	.95

(sex x SES) were run using each reduced data set score as a dependent measure. There were no significant main effects for sex, but all four dependent measures had significant effects for SES ($p < .01$).

TABLE 3

TEST CORRELATIONS

	1	2	3	4
1. Letter Matching	--	.21	.36	.43
2. Rhyming		--	.45	.26
3. Sound Matching			--	.29
4. Letter Recognition				--

TABLE 4

MEAN SCORES FOR REDUCED DATA SETS

	No. items	Males	Females
Rhyming	12	9.45	9.35
Sound Matching	12	7.56	7.67
Letter Matching	12	7.60	7.18
Letter Recognition	10	3.90	3.54

		SES			
	No. items	1	2	3	4
Rhyming	12	10.90	10.43	10.26	6.30
Sound Matching	12	8.50	8.40	8.02	5.72
Letter Matching	12	8.95	8.00	7.57	5.28
Letter Recognition	10	3.76	5.12	3.85	2.30

DISCUSSION

Letter recognition. The results of the letter recognition test show signs of selective learning, but also reflect the relatively low priority given by Israeli teachers and parents to letter name learning. For the unreduced data set, the percentage correct varied from 33.9 percent in the highest SES group to 16.0 percent in the lowest group. (The combined average was 28.5 percent correct.) For the reduced set, the highest average score was obtained by the mid-high group (51.2 percent correct), while the lowest average was obtained by the lowest SES group (23.0 percent correct). The combined average on the reduced set was 37.2 percent correct.

Comparable data from the USA on alphabet recognition are reported by Chapman (1971, p. 11). The subjects were 138 kindergarten students, tested in February of 1971 in Madison, Wisconsin, a city of about 170,000 persons who work primarily in light industry or white collar jobs. Results for recognition of capital letters printed in sans serif type were 86 percent for the high SES group, 74 percent for the middle group, and 56 percent for the low group. (The middle and low groups for the Wisconsin data represent a relatively narrower range of socioeconomic status than do the Israeli groupings, especially at the low end of the scale.) The USA average reflects a considerably higher emphasis than the Israeli data on letter naming in reading readiness. A rank ordering of the letters according to the number of students responding correctly to each shows no major change over the results obtained a year ago in Israel (Venezky et al., 1972).

The general conclusion to be drawn from these data is that letter naming, because of its relatively low scores, is not a good predictor of reading success. However, the letter naming test, using the 10-item reduced set, may still prove useful for comparing skills across cultures.

Letter matching. In the unreduced data set there were 416 errors on the items which contained an order-reversal distractor (items 1-10). Of these errors 13 were by selection of the nonreversal distractor; the remaining 403 were by selection of the order reversal. (Thirty-seven Ss--16 males and 21 females--made 5 or more reversal errors.) These results indicate quite clearly that for shorter items (items 1-10 were either two or three letters in length) order reversals are about the only errors to expect from Israeli kindergarten children. The relatively high error rate on items with four and five letters (33 percent errors) indicates, however, that word details are occasionally overlooked when the matching task is made more complex. From these results it is concluded that two letter string matching tests are needed: one to test for order reversals in short and medium-length words and one to test for attention to detail in longer words. This same conclusion was reached in the USA on the basis of similar tests (Chapman, 1971).

Sound matching. Percentages correct for each sound tested were 78.1 percent for /s/, 68.5 percent for /g/, and 62.7 percent for /a/. It is difficult to compare these results, however, since the sound /a/ occurred in medial position, while the other two could occur in any position. (Nevertheless, the relative difficulties are similar to those found in USA studies, with medial vowels being more difficult to match than initial consonants, and stop consonants being more difficult than fricatives.) Results on sound matching for each SES group are similar to the results for the other three skills: decreasing scores with decreasing SES, with the largest difference being between the lowest level and all others.

Analyses of individual items revealed no consistent pattern for explaining item difficulties. This tends to indicate that the familiarity of the alternatives and the quality of the drawings are important factors in test design.

Rhyming. The rhyming test showed a high reliability (Hoyt; .89) and correlated the highest (.45) among the other tests with sound matching, with which it is logically related. The relatively low correlations with letter string matching (.21) and alphabet recognition (.26) indicate that the test scores do not depend highly upon any general test-taking ability.

The high level of mastery of this test (66.4 percent) probably reflects the emphasis which rhyming receives in the Israeli kindergartens.

CONCLUSIONS

For purposes of instruction, a new basic skills test should be constructed to include the following skills:

letter string matching--order
letter string matching--detail
sound matching
rhyming

The formats used in this test should be retained, but the items altered according to the item data obtained.

IV

STUDY 2

PILOT TEST OF THE REVISED BASIC SKILLS TEST, FALL 1973

Based upon results obtained from a large-scale testing in the spring of 1972, modified tests were developed for testing letter order, word detail, sound matching, and rhyming. These tests were developed separately and then pilot tested as a unit in the fall of 1973.

METHOD

Subjects

Ninety-four subjects participated in the pilot test, all drawn from four lower-middle SES kindergartens in the Tel Aviv area. All subjects from two classes received the two letter matching tests while those from the other classes received the sound tests.

Materials

The two letter string tests were identical in format to the letter matching test described in the report on the spring 1972 testing. However, each test contained 16 items. Items for detail were four or five letters in length while those for order all contained three letters.

The rhyming and sound matching tests each contained 12 items and were identical in format to those described for spring 1972.

Procedure

All subjects were tested individually by an experimenter, with the order of tests counterbalanced across subject groups.

RESULTS

Group Comparison

Means and standard deviations for each test are shown in Table 5. The test codes for this and all succeeding tables are:

1. Letter order
2. Word detail
3. Sound matching
4. Rhyming

TABLE 5

TEST RESULTS--STUDY 2

School	N	$\bar{X}$	S.D.	Test
A	16	7.19	2.46	1
A	16	7.94	2.64	2
B	24	8.46	2.48	1
B	24	10.00	2.30	2
D	24	7.46	2.83	3
D	25	7.76	3.22	4
E	29	7.79	2.70	3
E	29	9.66	2.59	4

The product-moment correlation between the two visual tests was .549, and between the two sound tests, .471. Independent t-tests were used to compare schools, using each test as a dependent measure. No significant differences were found at the .01 level. Similarly no significant sex differences were found at the .01 level (or .05).

Item Analyses

Because of the small subject population, item analyses were restricted to the quartile summaries shown in Tables 6-9.

From these summaries, it can be seen that the sound tests contain the greatest number of items which show a consistent increase in correct responses with increasing total score. However, since these tests were administered at the beginning of the school year, high item reliabilities were not anticipated.

CONCLUSIONS

The raw scores indicated difficulty levels appropriate for the beginning of the school year in lower-middle SES classes. However, the item analyses indicated several items in each test which should be replaced. Plans were made to generate new items and to rerun the tests.

TABLE 6

QUARTILE SCORES--LETTER ORDER

Item	Percentage Correct			
	Low	Low-Mid	Hi-Mid	Hi
1	27.27	50.00	33.33	66.67
2	27.27	50.00	33.33	88.89
3	36.36	57.14	83.33	66.67
4	54.55	42.86	66.67	88.89
5	9.09	21.43	33.33	22.22
6	27.27	21.43	33.33	66.67
7	63.64	71.43	66.67	77.78
8	0.00	35.71	66.67	55.56
9	18.18	42.86	83.33	88.89
10	27.27	50.00	50.00	55.56
11	45.45	71.43	66.67	100.00
12	63.64	78.57	83.33	100.00
13	27.27	28.57	66.67	66.67
14	45.45	57.14	50.00	100.00
15	27.27	50.00	50.00	44.44
16	0.00	21.43	33.33	66.67

N = 40

N's by quartile 11, 14, 6, 9

TABLE 7

QUARTILE SCORES--WORD DETAIL

Item	Percentage Correct			
	Low	Low-Mid	Hi-Mid	Hi
1	36.36	37.50	77.78	75.00
2	63.64	75.00	88.89	75.00
3	9.09	0.00	44.44	66.67
4	9.09	50.00	77.78	50.00
5	0.00	12.50	88.89	91.67
6	63.64	87.50	66.67	100.00
7	36.36	62.50	66.67	58.33
8	54.55	62.50	33.33	100.00
9	9.09	37.50	33.33	66.67
10	63.64	62.50	77.78	91.67
11	36.36	75.00	44.44	66.67
12	36.36	62.50	66.67	83.33
13	9.09	25.00	33.33	58.33
14	63.64	87.50	77.78	100.00
15	72.73	75.00	100.00	75.00
16	18.18	37.50	22.22	50.00

N = 40

N's by quartile 11, 8, 9, 12

GPO 810-816-4

TABLE 8

QUARTILE SCORES--SOUND MATCHING

Item	Percentage Correct			
	Low	Low-Mid	Hi-Mid	Hi
1	53.85	93.75	77.78	93.33
2	23.08	62.50	88.89	93.33
3	38.46	75.00	66.67	93.33
4	30.77	62.50	77.78	93.33
5	30.77	56.25	88.89	93.33
6	38.46	68.75	88.89	100.00
7	23.08	93.75	88.89	100.00
8	23.08	31.25	66.67	80.00
9	38.46	56.25	77.78	93.33
10	30.77	50.00	77.78	86.67
11	7.69	56.25	55.56	66.67
12	38.46	18.75	44.44	66.67

N = 53

N's by quartile 13, 16, 9, 15

TABLE 9

QUARTILE SCORES--RHYMING

Item	Percentage Correct			
	Low	Low-Mid	Hi-Mid	Hi
1	42.86	72.73	94.44	100.00
2	42.86	63.64	72.22	100.00
3	21.43	81.82	94.44	100.00
4	14.29	72.73	83.33	100.00
5	42.86	63.64	94.44	100.00
6	50.00	72.73	94.44	100.00
7	50.00	72.73	94.44	100.00
8	21.43	72.73	77.78	100.00
9	50.00	54.55	100.00	100.00
10	42.86	36.36	83.33	100.00
11	28.57	72.73	77.78	100.00
12	42.86	54.55	100.00	100.00

N = 54

N's by quartile 14, 11, 18, 11

V

STUDY 3

SES DIFFERENCES IN THE KNOWLEDGE OF PREPOSITIONS BY ISRAELI KINDERGARTNERS

Language ability, particularly as measured by vocabulary recognition, has been shown in the United States to relate to socioeconomic level and, thereby, to academic achievement (Templin, 1957; Stodolsky & Lesser, 1967). The experiment described here was an attempt to assess whether or not the Israeli kindergartner's knowledge of certain prepositions varied with socioeconomic status.

Prepositions were selected for testing because their usage by children develops late and often is not fully developed even by first grade (Jespersen, 1922; Menyuk, 1963; Bar-Adon, 1971). However, very little is known about children's comprehension of prepositions as compared to what's known about their usage of them. Of the tests commonly given in kindergarten and the lower primary grades in the United States for reading readiness, language development, or cognitive skills, only one--the Boehm Test of Basic Concepts (Boehm, 1969)--assesses understanding of prepositions to any large degree. The ITPA, for example, contains only one question that directly assesses understanding of a preposition. Almost all other primary-level tests for vocabulary concentrate on content words, and in particular upon those which can be represented by pictures.

METHOD

Subjects

The subjects were 24 kindergartners between the ages of five and six, selected from public kindergartens in the Tel Aviv area. Originally three boys and three girls were selected randomly for each SES level. However, a reexamination of the background data after the testing was completed led to the shift of one student from the upper-middle group to the lower-middle group, giving the following subject distribution: 6 high, 5 upper-middle, 7 lower-middle, and 6 low.

Stimuli and Procedure

The stimuli were 16 picture sets (items), each consisting of three outline drawings on a single 4" x 9" white card. Each picture in a set represented a different spatial relationship between two or more objects. For example, one item showed (a) a dog running <u>to</u> a house; (b) a dog running <u>inside</u> a house; and (c) a dog running <u>from</u> a house.

Two different items were prepared for each of the following prepositions: to, from, near, between, inside, above, under, outside. (Hebrew el, me, al yad, bayn, b'emsa, m'al, metachat, mechutz).

The experimenter presented the picture sets one at a time to a subject. The objects in each picture were named; then the experimenter asked the subject a question about the objects (e.g., "Which picture shows the dog running to the house?"). Subjects responded by selecting one of the three pictures. A single ordering of the stimuli was used for all subjects. Testing occurred within six weeks of the beginning of school in 1971 and was done by a native Israeli graduate student.

RESULTS

The mean percentage correct for each socioeconomic level (Table 10) shows the upper three groups clustered closely together at around 84 percent correct, while the lower group is far below at 59.4 percent correct.

TABLE 10

MEAN NUMBER OF CORRECT RESPONSES FOR EACH SES LEVEL

	$\bar{X}$	%
High	13.67	85.5
Upper-middle	13.40	83.8
Lower-middle	13.43	84.0
Low	9.67	59.4

The mean for all 24 subjects was 12.54 (78.5 percent correct) and the standard deviation was 3.20. The distribution of test scores across the entire subject population approaches a normal distribution, with the mean skewed toward the high end of the scale. Five of the six low SES subjects account for the five lowest scores, but the scores above the mean are distributed among the other three groups.

A one-way analysis of variance for socioeconomic status showed a significant effect ($F(3/20) = 7.45$; $p < .05$). A post-hoc Sheffé test showed significant differences only between the low group and each of the other three groups. The mean number of correct responses for each preposition, averaged across item pairs, is shown in Table 11 where it can be seen that to was the most difficult test item while inside was the easiest. To determine the influence of the pictures themselves on responses, difference scores were obtained by subtracting the two scores for each preposition from each other and dividing the result by the average of the two scores. Six of the eight difference scores were less than 13 percent of their average scores; one was 32.3 percent (outside) and one was 49.5 percent (between).

TABLE 11

MEAN NUMBER OF CORRECT RESPONSES FOR EACH PREPOSITION
(Maximum = 24)

	$\bar{X}$	%
1. to (el)	14.0	58.4
2. outside (mechutz)	15.5	64.6
3. from (me)	18.0	75.0
4. between (bayn)	18.2	75.8
5. near (al yad)	20.0	83.3
6. above (m'al)	20.8	86.7
7. under (metachat)	21.2	88.4
8. inside (b'emsa)	22.3	93.0

DISCUSSION

The scores of the three highest socioeconomic groups showed adequate knowledge of the prepositions tested, especially for the beginning of kindergarten. The lack of significant differences between any of these three levels is consistent with results for other tests of basic prereading skills found by Venezky et al. (1972). For the low group, the responses suggest deficits in knowledge of certain prepositions and possible inadequacies in the test itself. One of the most difficult items, outside, is also the most problematical for a three-choice, pictorial test. Of the two distractors which must be drawn, one can be unambiguously wrong (inside), but any other relationship is potentially interpretable as outside (e.g., under, near, above, from, to). Of the remaining prepositions, five represent static relationships between or among objects (between, near, above, under, inside), but two represent dynamic relationships (to, from), which must be concluded from orientation and implied motion. Accurate portrayal of the latter two prepositions proved to be difficult, and may account for part of the errors on both. However, the generally high level of scores, when viewed in comparison to results from tests of other abilities which relate more directly to reading, do not suggest by themselves drastic deficits in understanding of these prepositions. Instruction in the use of prepositions could be considered if the deficits shown by the low group still existed at entry to first grade, where reading instruction in Israel begins.

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